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FOREST RESOURCES OF ELK, FOREST, McKEAN, AND WARREN COUNTIES, PENNSYLVANIA

Northeastern
Forest Experiment Station
Upper Darby, Pa.
V.L. Harper, Director

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Forest Survey Release N°1 October 1948

FOREWORD

This release presents statistics on forest area and timber volumes in Elk, Forest, McKean, and Warren Counties of Pennsylvania. It includes six statistical tables on forest area and fourteen on timber volumes. These tables are followed by a brief description of Forest Survey procedure and by estimates of the accuracy of forest-area and timber-volume figures. Because many of the terms used in this release have special meanings, an explanation of the terms used may be found at the end of the report.

This report was prepared by the Forest Survey organization at the Northeastern Forest Experiment Station under the direction of Frank A. Ineson, assisted by Harry W. Camp, Jr., in charge of inventory; Roland H. Ferguson, in charge of compilations; and Carl J. Holcomb, field supervisor. Field work in these counties began in April and was completed in September 1947. It was conducted by George E. Doverspike, Adrian M. Gilbert, Ted Grisez, and Alvin K. Wilson of the Forest Survey and W. M. Stiteler and W. W. Wentz of the Allegheny National Forest. Aerial photographs were furnished by the Pennsylvania State Planning Board.

Similar reports will be issued for other counties or county groups within a state as the field work progresses and the statistics are compiled. After an entire state is covered in this manner, a comprehensive report for a state as a whole will be issued in which the findings of the Forest Survey on forest area, timber volume, growth, and commodity drain will be analyzed to present a picture of the current and prospective forest situation.

The Forest Survey is conducted in the various forest regions by the forest experiment stations of the Forest Service. The project in the Northeast is directed by the Northeastern Forest Experiment Station with regional headquarters in Upper Darby, Pennsylvania.

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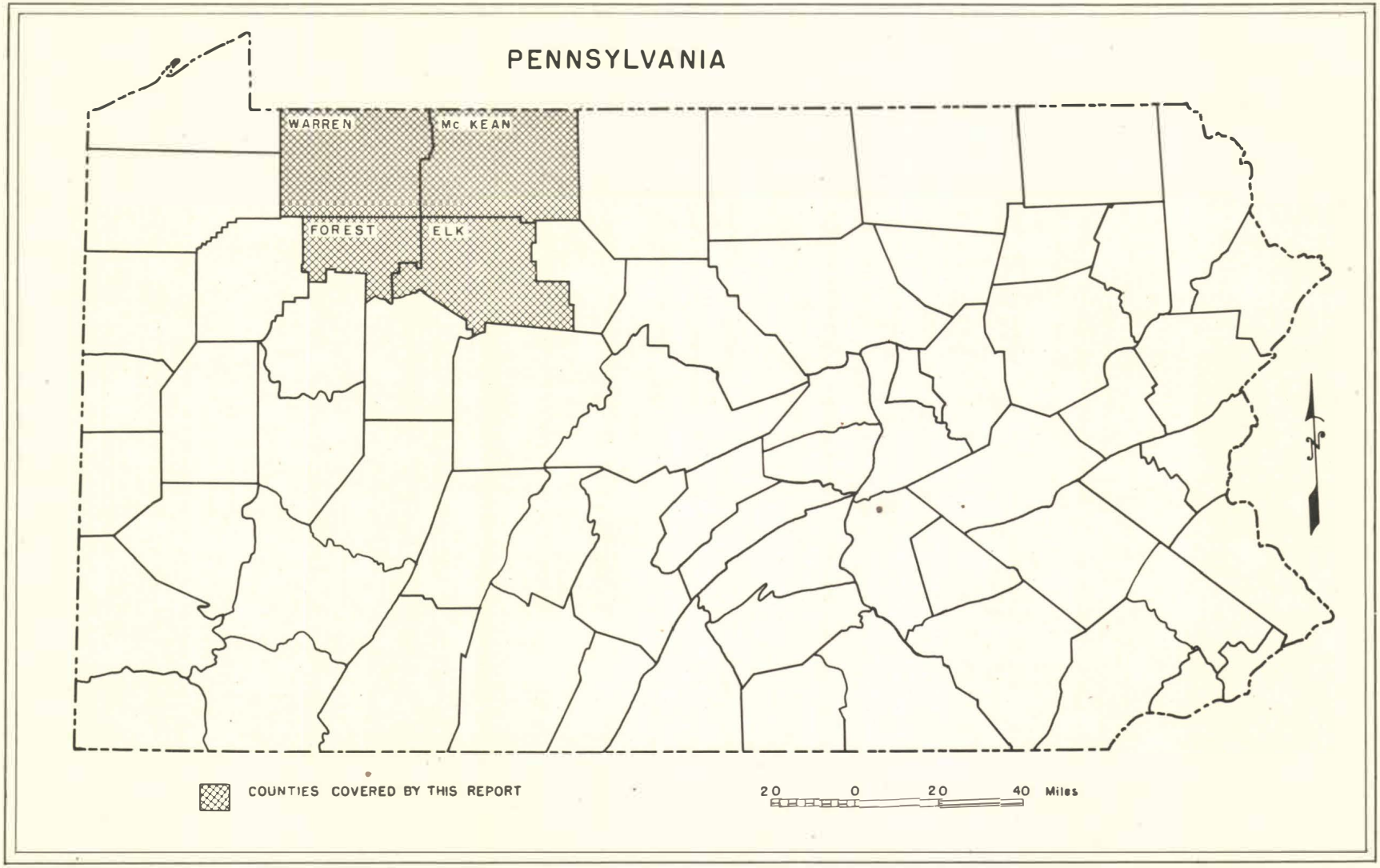
PENNSYLVANIA
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Mc KEAN
FOREST
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FOREST RESOURCES OF ELK, FOREST, McKEAN, AND WARREN COUNTIES, PENNSYLVANIA

compiled by

Forest Survey Staff
Northeastern Forest Experiment Station

SALIENT STATISTICS

Elk, Forest, McKean, and Warren Counties, Pennsylvania, are located in the high, dissected plateau section of the Allegheny Plateau. The topography in this area is gently rolling except along the main streams. Elevations range from 1,000 feet to 2,400 feet above sea level. About 90 percent of the area drains into the Allegheny River; the remainder into the Susquehanna. These four counties have a gross land area of 2,007,100 acres, of which 1,688,800 acres or 84 percent is forested.

The population in 1940 was 140,000, of which 82,000 were in rural sections. There is some farming in each of the counties but this activity is overshadowed by other industries. Lumbering was the principal industry until the early thirties when oil and gas production became prominent. Wood-products industries are still important. There are several sawmills, dimension mills, furniture factories, a paper and pulp mill, several chemical-wood plants, several tanneries, and a toy factory. The area is served by four railroads and most sections are fairly accessible to a good road network.

Public ownership.--About 40 percent of the forest area is in public ownership. The Allegheny National Forest is completely embraced within these four counties. It contains 458,700 acres of forest land. The Commonwealth of Pennsylvania owns 192,400 acres of forest land, 124,100 of which is in game land, the remainder largely in State forests. The forest area in municipal ownership (7,500 acres) is largely in the Bradford municipal watershed. Scattered throughout the four counties are several small areas that have been set aside for recreation and natural areas. Altogether there are about 6,900 acres formally reserved from cutting and therefore classed as noncommercial.

Forest types.--The commercial forest area of 1,681,900 acres is divided among four principal forest types. Northern hardwood, with 64 percent of the commercial forest area, is the most important type both in acreage and economic value. Black cherry, red maple, sugar maple, and beech are the principal species. The aspen type covers 17 percent

of the area; it is scattered in small patches throughout the four counties, but is found principally in the southern portion where large areas were burned over following logging. It is also found on abandoned fields, land recently logged, and along streams. A thick undergrowth of grass and bracken fern hampers reproduction in the lightly stocked stands. The oak types, covering 15 percent of the area, usually occur on the dry, sandy ridges as well as on south and west slopes facing the major drainages. The hemlock type now covers only 4 percent of the commercial forest area. It was formerly much more important in this section. It generally occurs in small patches along streams.

Stand-size class.--The bulk of the commercial forest area is in second-growth stands of pole size. About 53 percent is in pole-timber stands, 20 percent in light saw-timber stands, only about 11 percent in medium and heavy saw-timber stands, 6 percent in seedling and sapling stands, and 10 percent in poorly stocked stands and unstocked areas. The medium and heavy saw-timber stands average 7,500 board feet per acre, and the light saw-timber stands, 2,900. The pole-timber stands contain an average of 400 board feet of saw timber and an additional 13 cords per acre of smaller material. The saw-timber stands in these four counties are generally in tracts over 50 acres in size. About 27 percent of the stands range from 11 to 50 acres and 12 percent are 10 acres or less in extent.

Sawlog volume.--As to the volume of sawlog material; in all there are about 2,722,900 M board feet in these four counties. About half of this is located in medium and heavy saw-timber stands and more than one-third of it in light saw-timber stands. The remainder is scattered throughout the other younger and lightly stocked stands.

Hardwoods account for 84 percent of the sawlog volume, the principal species being black cherry, red oak, beech, red maple, and sugar maple. The most prominent softwood species is hemlock, followed by white pine. About 54 percent of the hardwood volume is in trees ranging from 11.0 to 14.9 inches d.b.h. (diameter outside bark at $4\frac{1}{2}$ feet above the ground), 31 percent in trees from 15.0 to 18.9 inches, and only 15 percent in trees 19.0 inches and larger. About 43 percent of the softwood volume is in trees ranging from 9.0 to 14.9 inches d.b.h., 30 percent in those from 15.0 to 18.9 inches, and 27 percent in trees 19.0 inches and larger. The large volume in small saw-timber tree sizes reflects the relatively young character of the stands. These trees could be the effective growing stock for sawlog operations during the next few decades.

All sawlog volumes are net; deductions have been made for rot, crook, and other defects. About 39 percent of the board-foot volume is in trees that appear free from defect. About 26 percent is in trees with crook, sweep, or other sound defects, amounting to about 9 percent of the gross tree volume on the average. About 20 percent of the volume is in trees having rot or other unsound defect, averaging 20 percent per tree. Some 15 percent of the volume is in trees having both sound and

unsound defect, averaging 21 percent. The average cull of all saw-timber trees is 10 percent.

Cordwood volume.--Cordwood volume, that is, volume in addition to that in sawlog material, is relatively large in these four counties. There are nearly 21,000,000 cords. This volume is found in pole-timber trees, in the upper stems and limbs of saw-timber trees, and in the sound volume of cull trees. The volume in pole-timber trees comprises 81 percent of the cordwood volume. Cordwood volume in hardwoods accounts for 96 percent of the total of such material.

Cubic-foot volume.--All together, in trees 5.0 inches and larger there is 1,830,200 M cubic feet of solid wood content. Nearly 61 percent of this volume is in pole-timber trees, 25 percent in sawlog material, and the remainder in the upper stems and limbs of saw-timber trees and in cull trees. Less than 1 percent of the cubic-foot volume is in so-called nonmerchantable species such as sassafras, blue beech, ironwood, pin cherry, and shadbush. Less than one-third of the cubic-foot volume of softwoods is in trees ranging from 5.0 to 8.9 inches d.b.h. and nearly 25 percent in trees 17.0 inches and larger. On the other hand, nearly half of the hardwood cubic-foot volume is in trees ranging from 5.0 to 8.9 inches d.b.h., whereas only 12 percent is in trees 17.0 inches and larger. This indicates the aggressive nature of hardwood regeneration.

Table 1.--Commercial and noncommercial forest area by county, 1947

County	Forest area				Nonforest area		Total land area 1/
	Commercial	Noncommercial	Total forest				
	Acres	Acres	Acres	Percent	Acres	Percent	Acres
Elk	465,100	200	465,300	89.9	52,500	10.1	517,800
Forest	244,200	2,400	246,600	91.7	22,200	8.3	268,800
McKean	538,800	3,000	541,800	84.9	96,300	15.1	638,100
Warren	433,800	1,300	435,100	74.7	147,300	25.3	582,400
Total	1,681,900	6,900	1,688,800	84.1	318,300	15.9	2,007,100

1/ From Areas of the United States 1940, Bureau of the Census.

Table 2.--Commercial forest area by ownership class and county, 1947

Ownership class	Elk	Forest	McKean	Warren	Total	
	Acres	Acres	Acres	Acres	Acres	Percent
Federal:						
National forest	110,600	108,400	120,500	114,700	454,200	27.0
Other	--	--	--	--	--	
Total Federal	110,600	108,400	120,500	114,700	454,200	27.0
State, county, and municipal	126,800	7,200	31,000	32,500	197,500	11.7
Private:						
Farm woodland 1/	20,900	10,000	37,500	81,900	150,300	8.9
Other	206,800	118,600	349,800	204,700	879,900	52.4
Total private	227,700	128,600	387,300	286,600	1,030,200	61.3
All ownerships	465,100	244,200	538,800	433,800	1,681,900	100.0

1/ Census of Agriculture: 1945.

Table 3.--Commercial forest area by county, forest type, and stand-size class, 1947

ELK COUNTY

Stand-size class	Forest type				All forest types
	Hemlock	Aspen	Northern hardwood	Oak	
	Acres	Acres	Acres	Acres	Acres
Saw-timber stands:					
Medium and heavy	3,300	--	15,300	--	18,600
Light	7,000	--	45,000	--	52,000
Pole-timber stands	11,700	40,800	175,700	59,500	287,700
Seedling and sapling	--	21,600	17,900	--	39,500
Poorly stocked stands	--	67,300	--	--	67,300
All stands	22,000	129,700	253,900	59,500	465,100
FOREST COUNTY					
Saw-timber stands:					
Medium and heavy	2,600	--	5,000	2,500	10,100
Light	8,400	--	22,800	25,200	56,400
Pole-timber stands	3,400	4,000	79,100	32,500	119,000
Seedling and sapling	--	4,800	14,200	4,600	23,600
Poorly stocked stands	--	13,300	21,800	--	35,100
All stands	14,400	22,100	142,900	64,800	244,200
McKEAN COUNTY					
Saw-timber stands:					
Medium and heavy	3,100	--	58,800	10,100	72,000
Light	--	--	106,100	8,700	114,800
Pole-timber stands	--	35,100	246,900	3,600	285,600
Seedling and sapling	--	4,900	11,600	--	16,500
Poorly stocked stands	--	37,500	12,400	--	49,900
All stands	3,100	77,500	435,800	22,400	538,800
WARREN COUNTY					
Saw-timber stands:					
Medium and heavy	16,900	--	50,900	13,800	81,600
Light	6,800	--	62,700	43,300	112,800
Pole-timber stands	4,300	32,400	108,600	55,600	200,900
Seedling and sapling	--	5,400	19,600	--	25,000
Poorly stocked stands	--	13,500	--	--	13,500
All stands	28,000	51,300	241,800	112,700	433,800

Table 4.--Commercial forest area by forest type and stand-size class, 1947

Stand-size class	Forest type				All forest types	
	Hemlock	Aspen	Northern hardwood	Oak		
	Acres	Acres	Acres	Acres	Acres	Percent
Saw-timber stands:						
Medium and heavy	25,900	--	130,000	26,400	182,300	10.8
Light	22,200	--	236,600	77,200	336,000	20.0
Pole-timber stands	19,400	112,300	610,300	151,200	893,200	53.1
Seedling and sapling	--	36,700	63,300	4,600	104,600	6.2
Poorly stocked stands	--	131,600	34,200	--	165,800	9.9
All stands	67,500	280,600	1,074,400	259,400	1,681,900	100.0
Percent	4.0	16.7	63.9	15.4	100.0	

Table 5.--Commercial forest area by forest type and site class, 1947

Forest type	Site class			All sites
	Very good	Good	Fair	
	Acres	Acres	Acres	Acres
Hemlock	3,100	64,400	--	67,500
Aspen	7,900	213,200	59,500	280,600
Northern hardwood	340,200	705,300	28,900	1,074,400
Oak	36,200	203,600	19,600	259,400
All types	387,400	1,186,500	108,000	1,681,900
Percent	23.0	70.6	6.4	100.0

Table 6.--Commercial forest area by watersheds and stand-size class, 1947

Stand-size class	Watershed		Total
	Upper Susquehanna River	Allegheny River	
	Acres	Acres	Acres
Saw-timber stands:			
Medium and heavy	3,300	179,000	182,300
Light	14,000	322,000	336,000
Pole-timber stands	93,100	800,100	893,200
Seedling and sapling	--	104,600	104,600
Poorly stocked stands	14,400	151,400	165,800
All stands	124,800	1,557,100	1,681,900
Percent	7.4	92.6	100.0

Table 7.--Net board-foot volume on commercial forest land by forest type, stand-size class, and species group, 1947

(Log scale, International 1/4-inch rule)

Stand-size class and species group	Forest type				All forest types
	Hemlock	Aspen	Northern hardwood	Oak	
	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.
Saw-timber stands:					
Medium and heavy					
Softwood	123,800	--	89,700	9,400	222,900
Hardwood	81,600	--	907,300	157,100	1,146,000
Total	205,400	--	997,000	166,500	1,368,900
Light					
Softwood	52,800	--	75,000	28,200	156,000
Hardwood	25,900	--	533,800	260,300	820,000
Total	78,700	--	608,800	288,500	976,000
Pole-timber stands					
Softwood	12,000	3,500	19,100	11,100	45,700
Hardwood	10,400	22,000	219,900	55,900	308,200
Total	22,400	25,500	239,000	67,000	353,900
Other stands 1/					
Softwood	--	1,800	2,300	--	4,100
Hardwood	--	--	20,000	--	20,000
Total	--	1,800	22,300	--	24,100
All stands					
Softwood	188,600	5,300	186,100	48,700	428,700
Hardwood	117,900	22,000	1,681,000	473,300	2,294,200
Total	306,500	27,300	1,867,100	522,000	2,722,900
Percent	11.2	1.0	68.6	19.2	100.0

1/ Includes seedling and sapling stands, poorly stocked stands, and unstocked areas.

Table 8.--Average net board-foot volume per acre on commercial forest land by forest type, stand-size class, and species group, 1947

(Log scale, International 1/4-inch rule)

Stand-size class and species group	Forest type				All forest types
	Hemlock	Aspen	Northern hardwood	Oak	
	Bd.ft.	Bd.ft.	Bd.ft.	Bd.ft.	Bd.ft.
Saw-timber stands:					
Medium and heavy					
Softwood	4,780	--	690	360	1,220
Hardwood	3,150	--	6,980	5,940	6,290
Total	7,930	--	7,670	6,300	7,510
Light					
Softwood	2,380	--	320	370	460
Hardwood	1,170	--	2,250	3,370	2,440
Total	3,550	--	2,570	3,740	2,900
Pole-timber stands					
Softwood	610	30	30	70	50
Hardwood	540	200	360	370	350
Total	1,150	230	390	440	400
Other stands					
Softwood	--	10	20	--	20
Hardwood	--	--	210	--	70
Total	--	10	230	--	90
All stands					
Softwood	2,790	20	170	190	250
Hardwood	1,750	80	1,570	1,820	1,370
Total	4,540	100	1,740	2,010	1,620

Table 9.--Net cordwood volume on commercial forest land by forest type, stand-size class, and species group, 1947

(Standard cords, including bark)

Stand-size class and species group	Forest type				All forest types
	Hemlock	Aspen	Northern hardwood	Oak	
	M cords	M cords	M cords	M cords	M cords
Saw-timber stands:					
Medium and heavy					
Softwood	129	--	97	60	286
Hardwood	282	--	2,566	500	3,348
Total	411	--	2,663	560	3,634
Light					
Softwood	120	--	177	20	317
Hardwood	187	--	3,837	1,035	5,059
Total	307	--	4,014	1,055	5,376
Pole-timber stands					
Softwood	67	8	172	51	298
Hardwood	166	1,115	8,372	1,699	11,352
Total	233	1,123	8,544	1,750	11,650
Other stands					
Softwood	--	6	3	--	9
Hardwood	--	135	148	9	292
Total	--	141	151	9	301
All stands					
Softwood	316	14	449	131	910
Hardwood	635	1,250	14,923	3,243	20,051
Total	951	1,264	15,372	3,374	20,961
Percent	4.5	6.0	73.4	16.1	100.0

Table 10.--Average net cordwood volume per acre on commercial forest land by forest type, stand-size class, and species group, 1947

(Standard cords, including bark)

Stand-size class and species group	Forest type				All forest types
	Hemlock	Aspen	Northern hardwood	Oak	
	Cords	Cords	Cords	Cords	Cords
Saw-timber stands:					
Medium and heavy					
Softwood	5.0	--	0.8	2.3	1.5
Hardwood	10.8	--	19.7	18.9	18.4
Total	15.8	--	20.5	21.2	19.9
Light					
Softwood	5.4	--	0.8	0.3	0.9
Hardwood	8.4	--	16.2	13.4	15.1
Total	13.8	--	17.0	13.7	16.0
Pole-timber stands					
Softwood	3.5	0.1	0.3	0.4	0.3
Hardwood	8.5	9.9	13.7	11.2	12.7
Total	12.0	10.0	14.0	11.6	13.0
Other stands					
Softwood	--	(1/)	(1/)	--	(1/)
Hardwood	--	0.8	1.5	2.0	1.1
Total	--	0.8	1.5	2.0	1.1
All stands					
Softwood	4.7	(1/)	0.4	0.5	0.6
Hardwood	9.4	4.5	13.9	12.5	11.9
Total	14.1	4.5	14.3	13.0	12.5

1/ Less than 0.05.

Table 11.--Net board-foot volume on commercial forest land by species and stand-size class, 1947

(Log scale, International 1/4-inch rule)

Species	Saw-timber stands	Pole-timber stands	Other stands	Total	
	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	Percent
Softwoods:					
Hemlock	307,800	32,200	4,100	344,100	12.6
White pine	70,600	2,200	--	72,800	2.7
Other softwoods	500	11,300	--	11,800	.4
All softwoods	378,900	45,700	4,100	428,700	15.7
Hardwoods:					
Sugar maple	191,700	21,400	--	213,100	7.8
Red maple	224,800	28,000	--	252,800	9.3
Red oak	312,400	52,700	16,100	381,200	14.0
White oak	135,000	21,200	--	156,200	5.7
Chestnut oak	22,400	3,400	--	25,800	.9
Yellow birch	81,700	4,600	--	86,300	3.2
Beech	319,900	18,800	400	339,100	12.5
Ash	96,900	1,900	--	98,800	3.6
Basswood	38,100	16,000	1,500	55,600	2.0
Black cherry	462,900	104,100	2,000	569,000	20.9
Yellow poplar	14,200	6,500	--	20,700	.8
Cucumber	26,300	7,100	--	33,400	1.2
Aspen	7,900	7,200	--	15,100	.6
Elm	10,900	14,100	--	25,000	.9
Other hardwoods	20,900	1,200	--	22,100	.9
All hardwoods	1,966,000	308,200	20,000	2,294,200	84.3
All species	2,344,900	353,900	24,100	2,722,900	100.0
Percent	86.1	13.0	0.9	100.0	

Table 12.--Net cordwood volume 1/ on commercial forest land by species and stand-size class, 1947

(Standard cords, including bark)

Species	Saw-timber stands	Pole-timber stands	Other stands	Total	
	M cords	M cords	M cords	M cords	Percent
Softwoods:					
Hemlock	535	221	9	765	3.6
White pine	64	55	--	119	.6
Other softwoods	4	22	--	26	.1
All softwoods	603	298	9	910	4.3
Hardwoods:					
Sugar maple	1,442	1,067	--	2,509	12.0
Red maple	1,593	2,213	44	3,850	18.4
Red oak	713	837	51	1,601	7.7
White oak	310	567	10	887	4.2
Chestnut oak	110	273	--	383	1.8
Yellow birch	901	837	--	1,738	8.3
Beech	1,091	537	13	1,641	7.8
Ash	548	355	15	918	4.4
Basswood	108	154	3	265	1.3
Black cherry	1,007	2,833	108	3,948	18.9
Yellow poplar	21	50	--	71	.3
Cucumber	27	42	4	73	.3
Aspen	175	1,059	33	1,267	6.0
Elm	36	165	--	2/ 201	1.0
Other hardwoods	325	363	11	2/ 699	3.3
All hardwoods	8,407	11,352	292	20,051	95.7
All species	9,010	11,650	301	20,961	100.0
Percent	43.0	55.6	1.4	100.0	

1/ Does not include sawlog portion of saw-timber trees.
2/ Includes 237 M cords of so-called nonmerchantable species such as: sassafras, blue beech, ironwood, pin cherry, and shadbush.

Table 13.--Net board-foot volume on commercial forest land by species and county, 1947

(Log scale, International 1/4-inch rule)

Species	Elk	Forest	McKean	Warren	Total
	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.
Softwoods:					
Hemlock	60,100	28,300	88,300	167,400	344,100
White pine	6,200	49,800	--	16,800	72,800
Other softwoods	9,100	2,200	--	500	11,800
All softwoods	75,400	80,300	88,300	184,700	428,700
Hardwoods:					
Sugar maple	22,400	2,600	111,000	77,100	213,100
Red maple	31,900	28,800	77,800	114,300	252,800
Red oak	45,500	83,700	57,700	194,300	381,200
White oak	13,000	53,700	12,100	77,400	156,200
Chestnut oak	6,900	2,400	--	16,500	25,800
Yellow birch	9,700	14,900	34,600	27,100	86,300
Beech	23,800	17,200	188,000	110,100	339,100
Ash	400	7,300	60,700	30,400	98,800
Basswood	9,400	1,500	16,600	28,100	55,600
Black cherry	202,800	55,000	188,500	122,700	569,000
Yellow poplar	6,100	--	4,800	9,800	20,700
Cucumber	3,300	6,300	6,300	17,500	33,400
Aspen	2,100	400	4,500	8,100	15,100
Elm	--	--	5,700	19,300	25,000
Other hardwoods	1,100	1,300	900	18,800	22,100
All hardwoods	378,400	275,100	769,200	871,500	2,294,200
All species	453,800	355,400	857,500	1,056,200	2,722,900
Percent	16.7	13.0	31.5	38.8	100.0

Table 14.--Net cordwood volume on commercial forest land by species and county, 1947

(Standard cords, including bark)

Species	Elk	Forest	McKean	Warren	Total
	M cords	M cords	M cords	M cords	M cords
Softwoods:					
Hemlock	165	128	116	356	765
White pine	12	91	--	16	119
Other softwoods	22	4	--	--	26
All softwoods	199	223	116	372	910
Hardwoods:					
Sugar maple	475	78	1,295	661	2,509
Red maple	902	524	1,515	909	3,850
Red oak	365	438	197	601	1,601
White oak	221	357	37	272	887
Chestnut oak	235	11	5	132	383
Yellow birch	378	226	572	562	1,738
Beech	245	146	729	521	1,641
Ash	179	101	421	217	918
Basswood	79	3	100	83	265
Black cherry	1,394	686	1,457	411	3,948
Yellow poplar	20	--	32	19	71
Cucumber	36	8	5	24	73
Aspen	279	138	421	429	1,267
Elm	--	--	50	151	201
Other hardwoods	107	101	234	257	699
All hardwoods	4,915	2,817	7,070	5,249	20,051
All species	5,114	3,040	7,186	5,621	20,961
Percent	24.4	14.5	34.3	26.8	100.0

Table 15.--Net cubic-foot volume of all trees on commercial forest land by species, tree class, and kind of material, 1947

(Excluding bark)

Species	Saw-timber trees		Pole-timber trees	Cull trees	Total
	Sawlog material	Upper stems and limbs			
	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.
Softwoods:					
Hemlock	54,500	17,800	38,200	3,600	114,100
White pine	11,600	1,100	5,100	3,100	20,900
Other softwoods	1,800	1,500	200	400	3,900
All softwoods	67,900	20,400	43,500	7,100	138,900
Hardwoods:					
Sugar maple	47,800	13,200	134,400	15,500	210,900
Red maple	39,200	15,900	220,000	14,300	289,400
Red oak	59,700	21,200	78,900	3,900	163,700
White oak	24,400	8,900	47,200	1,600	82,100
Chestnut oak	4,100	1,500	22,600	800	29,000
Yellow birch	13,300	5,700	98,200	9,100	126,300
Beech	67,800	20,200	51,900	34,600	174,500
Ash	15,700	5,500	50,900	3,300	75,400
Basswood	8,700	3,200	12,900	1,100	25,900
Black cherry	89,200	29,000	215,700	11,900	345,800
Yellow poplar	3,200	1,000	3,400	200	7,800
Cucumber	5,200	1,800	2,300	700	10,000
Aspen	2,300	900	80,500	1,000	84,700
Elm	3,800	2,000	10,500	600	16,900
Other hardwoods	3,600	1,400	41,000	2,900	1/ 48,900
All hardwoods	388,000	131,400	1,070,400	101,500	1,691,300
All species	455,900	151,800	1,113,900	108,600	1,830,200
Percent	24.9	8.3	60.9	5.9	100.0

1/ Includes 15,400 M cubic feet of so-called nonmerchantable species such as: sassafras, blue beech, ironwood, pin cherry, and shadbush.

Table 16.--Net volume in cords of all trees on commercial forest land by species, tree class, and kind of material, 1947

(Standard cords, including bark)

Species	Saw-timber trees		Pole-timber trees	Cull trees	Total
	Sawlog material	Upper stems and limbs			
	M cords	M cords	M cords	M cords	M cords
Softwoods:					
Hemlock	697	228	491	46	1,462
White pine	149	14	66	39	268
Other softwoods	25	18	3	5	51
All softwoods	871	260	560	90	1,781
Hardwoods:					
Sugar maple	736	204	2,067	238	3,245
Red maple	601	245	3,385	220	4,451
Red oak	919	327	1,214	60	2,520
White oak	376	135	726	26	1,263
Chestnut oak	63	23	348	12	446
Yellow birch	205	88	1,510	140	1,943
Beech	1,043	311	798	532	2,684
Ash	241	84	783	51	1,159
Basswood	135	51	198	16	400
Black cherry	1,372	445	3,319	184	5,320
Yellow poplar	50	16	53	2	121
Cucumber	80	27	35	11	153
Aspen	37	14	1,237	16	1,304
Elm	59	30	162	9	260
Other hardwoods	52	22	632	45	751
All hardwoods	5,969	2,022	16,467	1,562	26,020
All species	6,840	2,282	17,027	1,652	27,801
Percent	24.6	8.2	61.2	6.0	100.0

Table 17.--Net volume in cords of all trees on commercial forest land by stand-size class, tree class, and kind of material, 1947

(Standard cords, including bark)

Stand-size class	Saw-timber trees		Pole-timber trees	Cull trees	Total
	Sawlog material	Upper stems and limbs			
	M cords	M cords	M cords	M cords	M cords
Saw-timber stands:					
Medium and heavy	3,552	1,057	2,226	353	7,188
Light	2,392	834	4,025	516	7,767
Pole-timber stands	840	363	10,538	748	12,489
Other stands	56	28	238	35	357
All stands	6,840	2,282	17,027	1,652	27,801

Table 18.--Net board-foot volume on commercial forest land by species group, diameter class, and county, 1947

(Log scale, International 1/4-inch rule)

SOFTWOODS

Diameter class (Inches)	Elk	Forest	McKean	Warren	Total
	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M bd.ft.
10	15,600	10,700	2,500	18,000	46,800
12	12,300	13,300	7,500	34,600	67,700
14	12,300	16,000	10,400	30,900	69,600
16	9,700	11,800	14,900	27,900	64,300
18	7,500	6,400	12,400	36,300	62,600
20	7,100	9,700	25,900	9,500	52,200
22 and over	10,900	12,400	14,700	27,500	65,500
All softwoods	75,400	80,300	88,300	184,700	428,700
HARDWOODS					
12	133,900	85,200	193,200	239,700	652,000
14	96,600	83,300	179,300	231,800	591,000
16	55,700	51,600	169,500	149,400	426,200
18	45,300	38,200	98,800	99,900	282,200
20	17,100	13,400	57,400	70,900	158,800
22 and over	29,800	3,400	71,000	79,800	184,000
All hardwoods	378,400	275,100	769,200	871,500	2,294,200
All species	453,800	355,400	857,500	1,056,200	2,722,900

Table 19.--Net cubic-foot volume of all trees on commercial forest land by species group, diameter class, and county, 1947

(Excluding bark)

SOFTWOODS

Diameter class (Inches)	Elk	Forest	McKean	Warren	Total
	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.	M cu.ft.
6	4,400	4,700	1,600	10,700	21,400
8	5,000	7,200	1,700	9,300	23,200
10	3,800	2,900	800	4,900	12,400
12	3,500	3,200	2,400	8,700	17,800
14	4,100	3,600	2,800	6,200	16,700
16	1,900	2,700	3,100	5,700	13,400
18	1,400	2,300	2,500	6,500	12,700
20	1,700	1,400	4,800	1,600	9,500
22 and over	1,900	2,100	3,000	4,800	11,800
All softwoods	27,700	30,100	22,700	58,400	138,900
		HARDWOODS			
6	121,600	67,100	152,500	108,300	449,500
8	94,200	54,900	128,700	90,400	368,200
10	74,200	36,000	100,900	78,200	289,300
12	31,100	19,300	44,600	52,600	147,600
14	21,400	18,500	43,000	50,500	133,400
16	13,400	12,300	39,900	33,300	98,900
18	15,300	11,700	48,500	32,500	108,000
20	3,500	4,200	15,800	18,300	41,800
22 and over	9,200	4,800	19,800	20,800	54,600
All hardwoods	383,900	228,800	593,700	484,900	1,691,300
All species	411,600	258,900	616,400	543,300	1,830,200

Table 20.--Species composition of each forest type, expressed in percent of net cubic-foot volume, 1947

Species	Forest type			
	Hemlock	Aspen	Northern hardwood	Oak
	Percent	Percent	Percent	Percent
Softwoods:				
Hemlock	41.5	1.6	4.3	3.0
White pine	6.9	--	.6	1.8
Other softwoods	--	.6	--	1.1
All softwoods	48.4	2.2	4.9	5.9
Hardwoods:				
Sugar maple	2.1	1.5	15.0	2.5
Red maple	7.3	9.2	19.0	6.9
Red oak	5.2	6.8	2.9	37.4
White oak	5.8	2.6	.4	22.2
Chestnut oak	.7	1.0	.5	7.0
Yellow birch	11.2	3.2	7.8	2.3
Beech	5.8	.2	12.1	2.3
Ash	1.6	--	4.6	4.3
Basswood	1.6	1.0	1.6	.6
Black cherry	6.1	17.3	23.9	2.0
Yellow poplar	--	1.5	.5	.1
Cucumber	.2	2.4	.4	.8
Aspen	.3	46.5	2.5	3.3
Elm	1.0	.5	1.2	--
Other hardwoods	2.7	4.1	2.7	2.4
All hardwoods	51.6	97.8	95.1	94.1
All species	100.0	100.0	100.0	100.0

FOREST SURVEY PROCEDURE

These estimates of forest area and timber volume are based upon data obtained from a sampling of the four counties. The following procedure was used:

Photo interpretation.--A large number of plots (about one to every 475 acres) were distributed regularly over the aerial photographs covering these counties. Photo interpreters first determined whether each plot was forest or nonforest. If forest, the stand in which the plot was located was examined through the stereoscope and classified as to forest type and stand-size class (based on stand volume and density).

Ground plot examination.--The next step was to examine enough randomly selected 1/2-acre ground plots to establish a reliable average volume per acre from a tally of trees by species and diameters at breast height. Estimates of cull, site quality, past use, and other items also were recorded. The selected ground plots averaged about one to 4,300 acres of forest land.

Compilation of data.--Photo interpretation and field-plot data were entered on punch cards in the Upper Darby office. Tabulations were made from these data, and these are presented in the set of tables herewith.

ACCURACY OF DATA

The number of observations taken on the aerial photographs and the number of ground plots examined in each stand-size class were such as to yield forest area and volume estimates of the highest possible degree of sampling accuracy for the amount of money available.

Some errors in the forest inventory are inescapable because: (1) area classifications may be imperfect and volume of sample trees is derived from measurements of diameter, height, and form and adjustments made for estimated defect; and (2) the estimated total is obtained by "blowing up" a sample.

Errors of the first class include: mistakes in measurement and judgment, imperfect volume tables, and possible faulty adjustment for defects. Every effort was made to keep such errors at a minimum and compensating, but the degree to which this may have been attained cannot be measured satisfactorily.

Errors of the second class are due to failure of the sample to perfectly represent the whole. These errors may be measured by the

standard deviation (or standard error). In the data presented, sampling errors for the four counties have been computed as:

	Percent
Forest area	± 1.7
Saw-timber area	± 11.0
Total board-foot volume	± 3.6
Board-foot volume in saw-timber stands	± 12.0
Total cubic-foot volume	± 2.2
Cubic-foot volume in pole-timber stands	± 7.2

If we assume no bias and no systematic errors, it is reasonable to expect that actual areas and volumes will be within the indicated range of reported areas and volumes about 2 times in 3, and within the range of 2 sampling errors about 19 times in 20.

EXPLANATION OF TERMS USED

Forest area.--Land bearing forest growth or land from which the forest has been removed but which shows evidence of past forest occupancy and which is not now in other use. Except for right of ways of active power lines, highways, roads, and railroads, strips of nonforest land less than 100 feet wide, and areas of less than 1 acre surrounded by forest were classified as forest.

Commercial forest area.--Forest land bearing or capable of bearing timber of commercial character and economically available now or prospectively for commercial use and not formally withdrawn from such use.

Noncommercial forest area.--Two classes of forest land are included: (1) commercially valuable forest land formally withdrawn from commercial use for parks, preserves, wilderness areas, and so forth; and (2) other land permanently incapable of producing commercial pole-timber or saw-timber stands. These areas are either rocky, mountainous, or do not possess the climate and soil qualities essential for the production of commercial timber crops.

Nonforest area.--All land areas other than forest, including the acreage in cultivation and pasture with less than 30 percent covered by tree canopy; land enclosed within the right of ways of active power lines, highways, roads, and railroads; abandoned roads when the soil has been removed or the pavement remains; marshes, bare rock, quarries, coal strippings, and gravel pits; water areas such as lakes, reservoirs, and ponds having less than 40 acres of area, and stream, sloughs, estuaries, and canals less than one-eighth mile in width (larger water areas are classified as "inland water" by the Bureau of the Census and not included within land area figures); and urban and other residential and industrial areas. Narrow belts of trees such as fence rows and stream margins less than 100 feet in width and small groups of trees less than 1 acre in area that are surrounded by nonforest land are considered nonforest.

FOREST TYPES

(See table 20 for the species composition of each forest type, expressed in percent of net cubic-foot volume.)

Hemlock.--Stands in which hemlock predominates. This type is generally found on fertile, moist soils of low flat-topped ridges and on the north and east slopes of stream valleys. The principal associates are yellow birch, red maple, white pine, black cherry, beech, white oak, and red oak. A small area of white pine-hardwood type has been included with the hemlock in this release.

Aspen.--Small pure stands of trembling and large-toothed aspen or stands in which aspen is predominant in mixture with black cherry, red maple, and red oak. Aspen stands often developed following severe fires in heavily cutover northern hardwood areas.

Northern hardwood.--This type is the most important in these four counties of the Allegheny Plateau. Black cherry is the principal species in association with red maple, sugar maple, beech, and yellow birch. A small area of river-bottom hardwood has been included.

Oak.--Red oak or white oak dominate most of the stands of this type with red maple the principal associate. These stands are generally found on the more heavily burned sites with thin soils. A small area of chestnut oak, which occurs along the higher ridges, has been included.

STAND-SIZE CLASSES

Medium and heavy saw-timber stands.--Stands having a net volume of 5,000 board feet or more per acre.

Light saw-timber stands.--Stands having a net volume of 1,500 to 4,999 board feet per acre.

Pole-timber stands.--Stands having a net volume of less than 1,500 board feet per acre but that are at least 10 percent stocked with pole-timber or larger trees. At least one-half the minimum stocking is in pole-timber trees. These stands generally contain at least 200 cubic feet in trees 5.0 inches and larger.

Other stands.--Stands of seedlings and saplings, poorly stocked stands, and unstocked areas.

Seedling and sapling stands.--Stands not qualifying either as saw-timber or pole timber but well stocked with seedlings and saplings (at least 40 percent of the stand area covered by crown canopy). These stands generally contain at least 300 seedlings and saplings 1.0 to 4.9 inches per acre.

Poorly stocked stands and unstocked areas.--Stands not qualifying for any of the other classes.

SITE CLASS

Site class.--Based on the average number of logs produced by mature trees in commercial forest areas. Where mature, dominant, or codominant trees were present, the following merchantable height classes, based on 16-foot logs, were used:

Site	Hardwoods	Softwoods
Very good	3 or more logs	5 or more logs
Good	1½ to 3 logs	3 to 5 logs
Fair	8 feet to 1½ logs	8 feet to 3 logs

Where no mature trees of the dominant or codominant crown classes were present, site was estimated from the species and growth of immature trees, the depth and type of soil, aspect, soil moisture, and the shrubby and herbaceous ground cover.

VOLUME ESTIMATES

(Volume in trees on areas classified as nonforest is not included; all volumes are net, that is, with defect deducted.)

Board-foot volume.--Includes the sawlog material in saw-timber trees estimated through use of the International 1/4-inch log rule, which closely approximates green lumber tally for square-edged boards. Top diameters vary with the limits of usable sawlog material. Deductions have been made for rot, crook, and other defects.

Cubic-foot volume.--Includes the sound wood, excluding bark, in: (1) the sawlog portion of saw-timber trees, (2) the upper stems of softwood saw-timber trees and the upper stems and limbs of hardwood saw-timber trees to a minimum of 4 inches inside bark, (3) the full stems of pole-timber trees to a minimum of 4 inches inside bark, and (4) the sound wood volume of cull trees. Deductions have been made for defect of unsound nature only.

Cordwood volume.--Includes the sound wood and bark in: (1) the upper stems of softwood saw-timber trees and the upper stems and limbs of hardwood saw-timber trees to a minimum of 4 inches inside bark, (2) the full stems of pole-timber trees to a minimum of 4 inches inside bark, and (3) the sound portions of cull trees. The standard cord (4 feet by 4 feet by 8 feet), including bark, was the unit of volume measurement used. This volume was derived from the cubic-foot volume (excluding bark) by applying a factor of 78 cubic feet per cord for conifers and 65 cubic feet per cord for hardwoods. Deductions have been made for unsound defect.

TREE CLASSES

Saw-timber tree.--A softwood tree at least 9.0 inches d.b.h. (diameter outside bark at 4½ feet above the ground on the upper side of the tree) and a hardwood tree at least 11.0 inches d.b.h. with a sound log at least 8 feet long and with at least half of the gross volume of the tree in sound material.

Pole-timber tree.--A tree that ranges from 5.0 inches d.b.h. up to the minimum saw-timber tree size and that gives promise of becoming a merchantable saw-timber tree.

Cull tree.--A tree that does not qualify as a saw-timber or pole-timber tree because of poor form, limbiness, rot, or other defect.

Tree-diameter class.--Each 2-inch diameter class includes all trees measuring from 1.00 inches below to 0.99 inches above the midpoint of the class. For example, the 6-inch class includes all trees whose diameters fall in the range of 5.00 inches to 6.99 inches.

SPECIES

The various tree species found in this area are listed below. Approved common names 1/ are shown in parentheses if these differ from the brief name used in the tables. Approved scientific names 1/ are underlined. If two or more species are included under a single name in the tables, the various species are listed or the word "species" appears after the approved scientific name for the genera.

Softwoods

Hemlock (Eastern hemlock)	- Tsuga canadensis
White pine (Eastern white pine)	- Pinus strobus
Other softwoods (Pitch pine)	- Pinus rigida
(Eastern red cedar)	- Juniperus virginiana

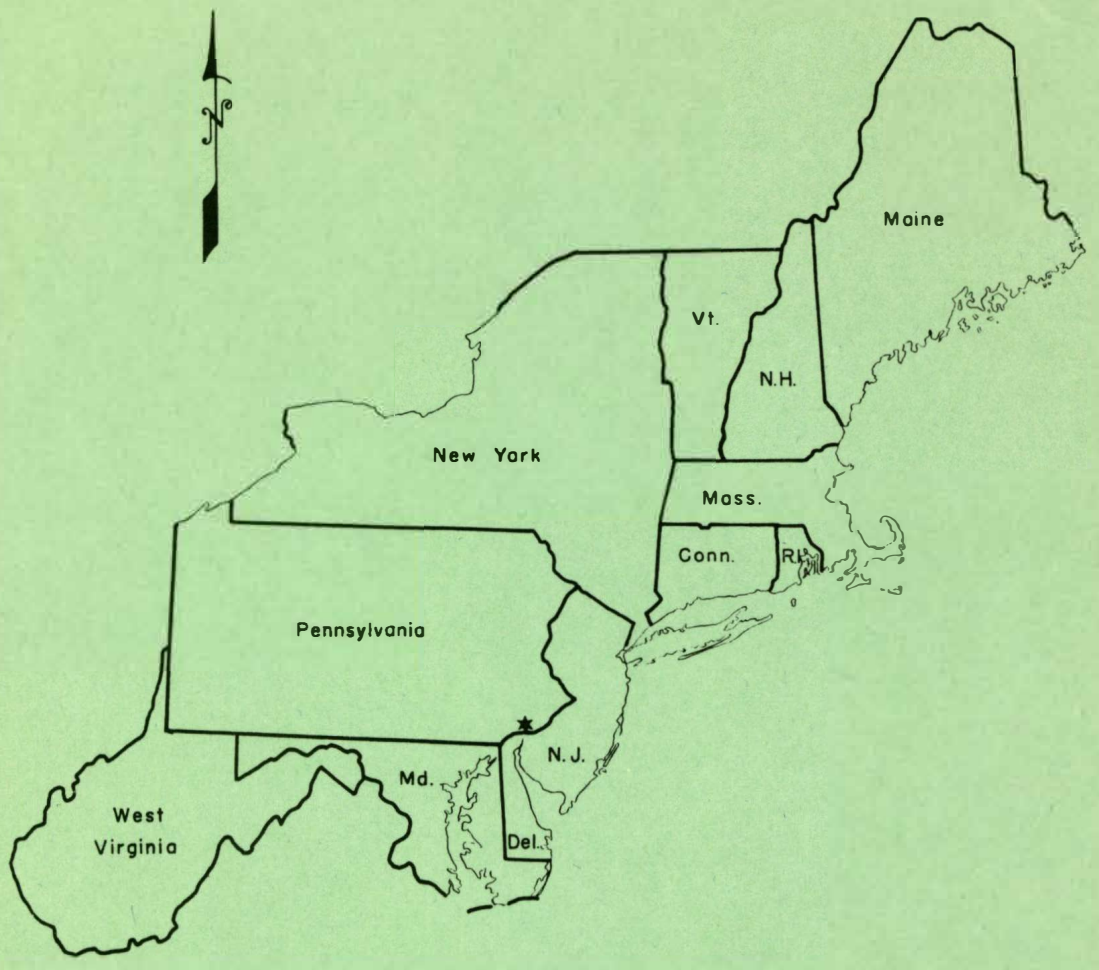
Hardwoods

Sugar maple	- Acer saccharum
Red maple	- Acer rubrum
Red oak (Eastern red oak)	- Quercus borealis maxima
White oak	- Quercus alba

1/ Kelsey, Harlan P., and Dayton, William A. Standardized plant names. Ed. 2, 675 pp. Harrisburg, Pa. 1942.

Hardwoods (continued)

Chestnut oak		- Quercus montana
Yellow birch		- Betula lutea
Beech (American beech)		- Fagus grandifolia
Ash		- Fraxinus species
Basswood (American linden)		- Tilia americana
Black cherry		- Prunus serotina
Yellow poplar (Tuliptree)		- Liriodendron tulipifera
Cucumber (Cucumbertree)		- Magnolia acuminata
Aspen		- Populus species
Elm (American elm)		- Ulmus americana
Other hardwoods	(Blackgum)	- Nyssa sylvatica
	(Black locust)	- Robinia Pseudoacacia
	(Black walnut)	- Juglans nigra
	(Hickory)	- Carya species
	(Paper birch)	- Betula papyrifera
	(American sycamore)	- Platanus occidentalis



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